

ABSTRACT

The current process for producing powder coatings can be replaced with a process utilizing supercritical fluids including polymer polymerization, compatibilized blending of powder coating ingredients, and particle size control and classification of the powder coating. Traditionally, powder coating resins are polymerized in solvent based system. Next, the resin is blended with additives in a twin screw extruder at high temperatures. The material is then ground and separated by particle size to form the finished powder coating. This invention replaces the previous process by performing all operations in a supercritical fluid, preferably, carbon dioxide. Polymerization is conducted at any pressure above critical pressure and temperature above critical temperature up to 190°C. Solubility of the polymer in the supercritical fluid allows for control and narrow distribution of the molecular weight and a polydispersity of about 2 or less. Compatibilized blending is effected by a chemical or a physical technique to encapsulate the powder coating additives in the polymer. Particle size control is effected by stepwise controlled depressurization of the mixing chamber or through controlled depressurization of the material into one or more chambers. The advantages are reduction in the number of processing stages, compatibility between processing stages, utilization of lower temperature free radical initiators for polymerization, small batch capability for blending versus set size extruders, utilization of lower temperature cross-linking agents, no fusing, no curing, more homogeneous blending of powder coating ingredients, increased particle size control, and improved gloss and strength of the powder coating.